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EXAMINER

DOVE, TRACY MAE

ART UNIT

PAPER NUMBER

1745

17

DATE MAILED: 01/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

| | |
|-------------------------------|-----------------------|
| Application No. 09/429,262 | Applicant(s) Kweon |
| Examiner Tracy Dove | Art Unit 1745 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on Nov 4, 2002

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

4) Claim(s) 1-12 is/are pending in the application.

4a) Of the above, claim(s) _____ is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-12 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claims _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some* c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) The translation of the foreign language provisional application has been received.

15) Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413) Paper No(s). _____

2) Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) Notice of Informal Patent Application (PTO-152)

3) Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____ 6) Other: _____

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DETAILED ACTION

This Office Action is in response to the communication filed on 11/4/02. Applicant's arguments have been considered, but are not persuasive. Claims 1-12 are rejected in view of the prior art of record. This Action is made **FINAL**, as necessitated by amendment.

Response to Amendment

The declaration under 37 CFR 1.132 filed 11/4/02 does not provide evidence of unexpected results for newly added claims 9-12 over the Miyasaka '208 reference. Specifically, the declaration does not state that the positive active material and the coated metal oxide are the same material in both the method of the instant invention and the method of Miyasaka. The declaration must show that coating active material *particles* containing active material A with a metal oxide B gives unexpected results over coating an active material *layer* containing active material A with a metal oxide B. Specifically, the declaration must disclose the only difference in the method of the instant invention and the method of Miyasaka is in the coating step.

Note claims 5-8 were previously indicated as allowable. However, newly found art has been used to reject claims 5-8. Thus, the indication of allowable subject matter has been withdrawn.

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Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 5, 6 and 9-11 are rejected under 35 U.S.C. 102(a) as being anticipated by

Takeuchi et al., WO 99/05734.

Takeuchi teaches a positive electrode active material comprising: a positive electrode active material body having a composition $Li_{1+x}Mn_{2-x-y}M_yO_4$ wherein M denotes at least one element other than Mn and a cover layer formed on a surface of the positive electrode active material body, the cover layer being composed of a metal oxide. See abstract.

Note that US Patent 6,458,487 is an issued patent of the international application. Thus, the English language document will be used to recite the relevant sections of Takeuchi WO 99/05734.

Regarding claims 9-11, Takeuchi teaches it is preferably that the cover layer composed of a metal oxide contains Al or Ti (col. 4, lines 28-30). The electrolyte and the active material are

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effectively separated by the cover layer, so that it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte, whereby a cycle characteristic at high temperature can be maintained (col. 5, lines 26-33). The surface of the active material is epitaxially covered with the metal oxide cover layer (col. 7, lines 22-29). The thickness of the cover layer is preferably in a range of 1-100 nm and completely covers the surface of the active material body (col. 7, lines 57-67). See also col. 9, lines 24-54. The covering material is blended with the active material body then the positive electrode is formed (col. 10, lines 10-21 and 62-67). Note the Tables contained in Takeuchi (M may be Co, Al or Cr).

Regarding claims 5 and 6, Takeuchi teaches a lithium manganese cobalt oxide was prepared (col. 14, lines 55-60), then the active material was added to water to prepare a solution. The salts of the metals to be contained in the cover layer are then added to the solution and stirred. The solutions were heated, dehydrated and fired in reflux of oxygen to prepare the active material with cover layer (col. 14, line 61-col. 15, line 2). In the case where materials such as Ti and Sn that are easily hydrolyzed are used, ethyl alcohol was used in place of the water, and isopropyl alkoxides of Li, Mn, Ti and Sc were used (col. 15, lines 3-8). See Examples 22-27, which teach a heating temperature of 300-900°C.

Thus the claims are anticipated.

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Claims 9 and 11 are rejected under 35 U.S.C. 102(e) as being anticipated by Fujino et al., US 6,428,766.

Fujino teaches a secondary battery having a positive electrode active material comprising a cobalt-coated lithium manganese complex oxide. A part of the manganese may be substituted with calcium or magnesium (abstract). The cobalt-coated lithium manganese complex oxide is prepared by oxidizing lithium manganese complex oxide particles dispersed in an aqueous alkali solution and a cobalt compound so that a cobalt oxide epitaxially grows on the lithium manganese complex oxide (col. 4, lines 35-42). See col. 8, lines 41-54 which discloses LiMn_2O_4 . The lithium manganese complex oxide may contain one or two elements selected from Ca, Mg, Al, Fe, Ni and the like (col. 9, lines 44-46).

Regarding claim 11, the coated amount of cobalt is in the range specified by equation (1), see col. 9, lines 1-16. This section of Fujino teaches why the coating should not be to thick or to thin. Furthermore, Table 1 teaches the diameter of various lithium manganese oxide reaction products. The diameters range from 0.03-0.25 μm (30-250 nm).

Claims 9-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Miyaki et al., US 6,365,299.

Miyaki teaches a nonaqueous secondary battery comprising a positive electrode and a negative electrode both containing a material capable of reversibly intercalating and deintercalating lithium. A protective layer is provided on the negative electrode and/or the

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positive electrode. See abstract. The protective layer preferably contains insulating organic or inorganic fine particles and has a thickness of 1-40 μm (1000-40000 nm). The inorganic particles may be oxides, especially those hardly susceptible to oxidation or reduction are preferred. Examples include oxides of sodium, potassium, magnesium, calcium, strontium and aluminum. TiO_2 is also useful. See col. 2, lines 40-col. 3, lines 14. The protective layer can be formed successively or simultaneously by applying an electrode material mixture onto a current collector (col. 6, lines 47-50). The surface of the oxide as a positive electrode active material can be coated with an oxide having a different chemical formula from the positive electrode active material (col. 16, lines 4-8). Examples of lithium containing metal oxide positive active materials are disclosed in col. 16, lines 26-col. 17, lines 13.

Thus the claims are anticipated.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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Claims 1-4, 7-8, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amatucci et al., US 5,674,645 in view of Takeuchi et al., WO 99/05734.

Amatucci teaches a lithium ion rechargeable battery having a lithium manganese oxy-fluoride positive electrode material. The material has the general formula:



where M is Co, Cr or Fe; and x, y and z are defined as in the abstract. See also Example 1 and Example 9.

Amatucci does not explicitly teach that the lithium manganese oxy-fluoride positive electrode material is coated with a metallic oxide.

However, Takeuchi teaches a positive electrode active material comprising: a positive electrode active material body having a composition $\text{Li}_{1+x}\text{Mn}_{2-x-y}\text{M}_y\text{O}_4$ wherein M denotes at least one element other than Mn and a cover layer formed on a surface of the positive electrode active material body, the cover layer being composed of a metal oxide. See abstract. Takeuchi teaches it is preferably that the cover layer composed of a metal oxide contains Al or Ti (col. 4, lines 28-30). The electrolyte and the active material are effectively separated by the cover layer, so that it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte, whereby a cycle characteristic at high temperature can be maintained (col. 5, lines 26-33). The surface of the active material is epitaxially covered with the metal oxide cover layer (col. 7, lines 22-29). The thickness of the cover layer is preferably in a range of 1-100 nm and completely covers the surface of the active material body (col. 7, lines 57-

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67). See also col. 9, lines 24-54. The covering material is blended with the active material body then the positive electrode is formed (col. 10, lines 10-21 and 62-67). Note the Tables contained in Takeuchi (M may be Co, Al or Cr). Takeuchi teaches a lithium manganese cobalt oxide was prepared (col. 14, lines 55-60), then the active material was added to water to prepare a solution. The salts of the metals to be contained in the cover layer are then added to the solution and stirred. The solutions were heated, dehydrated and fired in reflux of oxygen to prepare the active material with cover layer (col. 14, line 61-col. 15, line 2). In the case where materials such as Ti and Sn that are easily hydrolyzed are used, ethyl alcohol was used in place of the water, and isopropyl alkoxides of Li, Mn, Ti and Sc were used (col. 15, lines 3-8). See Examples 22-27, which teach a heating temperature of 300-900°C.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Takeuchi teaches the positive electrode material of a lithium secondary battery should be coated with a metal oxide cover layer to provide significant effects such that the lowering of the capacity in accordance with the progress of charge/discharge cycles at a high temperature can be effectively suppressed and the lowering of the open-circuit voltage (OCV) and capacity even after the battery is preserved or stored in a high-temperature situation can be also effectively suppressed (col. 2, lines 55-64). Furthermore, the electrolyte and the active material are effectively separated by the cover layer, so that it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte, whereby a cycle characteristic at high temperature can be

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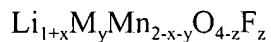
maintained (col. 5, lines 25-33). Also note col. 6, lines 30-54 of Takeuchi. Takeuchi teaches that in order to secure the high temperature characteristics without impairing the capacity characteristics, it is essential that a metal oxide is used as the covering material (col. 6, lines 62-65). Thus one of skill would be motivated to coat the active material of Amatucci with the metal oxide of Takeuchi because lowering of the open-circuit voltage (OCV) and capacity even after the battery is preserved or stored in a high-temperature situation can be effectively suppressed. One of skill would be further motivated to coat the active material of Amatucci with the metal oxide of Takeuchi because it becomes possible to prevent the Mn ion constituting a surface layer of the active material from being dissolved into the electrolyte.

Regarding the “1-20 hours” limitation of claim 8, one of skill would find this limitation obvious since both Takeuchi and the instant claims teach a metal-alkoxide solution that is subjected to a heating temperature of 300-900°C to convert the metal alkoxide to a metal oxide. Thus, one of skill would have known that a time duration similar to that of the instant invention would be required to convert the metal alkoxide solution of Takeuchi to the metal oxide constituting the cover layer.

Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amatucci et al., US 5,674,645 in view of Miyasaka, US 5,869,208.

Amatucci teaches a lithium ion rechargeable battery having a lithium manganese oxy-fluoride positive electrode material. The material has the general formula:

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where M is Co, Cr or Fe; and x, y and z are defined as in the abstract. See also Example 1 and Example 9.

Amatucci does not explicitly teach that the lithium manganese oxy-fluoride positive electrode material is coated with a metallic oxide.

However, Miyasaka teaches a lithium ion secondary battery having a positive electrode comprising an active material of a lithium transition metal oxide which is coated with a non-electron conductive protective layer. See abstract. The lithium transition metal oxide may have the formula $\text{Li}_y\text{Mn}_2\text{O}_4$ wherein $0 < y \leq 1.2$. The non-electron conductive protective layer that coats the positive active material comprises particles of a metal oxide selected from the group consisting of aluminum oxide, titanium dioxide and zirconium oxide. See col. 3, lines 16-23 and col. 4, lines 1-4. Table 1 lists preferred compositions of the positive electrode active material. Examples of electro-insulative material include alumina (aluminum oxide), calcium oxide, titanium dioxide and magnesia (magnesium oxide). See col. 6, line 59-col. 7, line 10. The protective layer generally has a thickness of 0.5-50 μm (500-50000 nm). See col. 7, lines 40-44.

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because Miyasaka teaches the positive electrode of the lithium ion secondary battery should be coated with a non-electron conductive (or electro-insulative) protective layer so that the surface of the positive electrode can be kept from lithium metal dendrite which may be produced on the negative electrode (col. 6, lines 59-64). Thus one

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of skill would be motivated to coat the active material of Amatucci with the metal oxide of Miyasaka because any metal dendrites formed can be kept from contacting the positive electrode and creating a short circuit.

Response to Arguments

Applicant's arguments with respect to claims 1-12 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tracy Dove whose telephone number is (703) 308-8821. The Examiner may normally be reached Monday-Thursday (9:00 AM-7:30 PM). My supervisor is Pat Ryan, who can be reached at (703) 308-2383. The Art Unit receptionist can be reached at (703) 308-0661 and the official fax numbers are 703-872-9310 (after non-final) and 703-872-9311 (after final).

January 15, 2003


Patrick Ryan
Supervisory Patent Examiner
Technology Center 1700